UCD CENTRE FOR ECONOMIC RESEARCH

WORKING PAPER SERIES

2008

Handedness and Depression: Evidence from a Large Population Survey

Kevin Denny,
University College Dublin

WP08/14

May 2008

UCD SCHOOL OF ECONOMICS
UNIVERSITY COLLEGE DUBLIN
BELFIELD DUBLIN 4

Handedness and depression: evidence from a large population survey

Kevin Denny*

School of Economics & Geary Institute

University College Dublin

May 21st 2008

Abstract:

This paper uses a new large population survey from twelve European countries to measure the association between handedness and depression. It is found that that depressive symptoms are significantly higher amongst left-handed men. While 19% of right handed men report experiencing depressive symptoms for at least a two week period, the figure for left handed men is almost 25%. For women the corresponding percentages are 33% and 36% respectively but the difference is not statistically significant. Using the EURO-D depression scale gives equivalent results. These results are consistent with one finding from an existing small scale study.

* Kevin.denny@ucd.ie tel: 353 1 716 4632. fax: 353 1 716 1108. Address: Geary Institute, University College Dublin, Belfield, Dublin 4, Ireland.

Introduction

A number of papers consider the relationship between handedness and various forms of psychiatric morbidity including depression and schizophrenia. There is no consensus about the association between handedness and major depression and no strong theoretical argument about what any such relationship might be – unlike the case of schizophrenia or manic depression (see Klar (1999), Crow (1997) or Sommer *et al* (2001) for example).

It is striking that virtually all the existing studies are from small clinical samples or somewhat larger, but still small, datasets, based on students. Hence it is difficult to infer anything about the relationship in the general population. In particular if the effect sizes of interest are small then the usual tests may be seriously underpowered[1]. Hence it is essential to examine this relationship in larger, more representative datasets.

Biederman *et al* (1994) find a positive association between left-handedness and depression in a sample of 260 boys between the age of 6 and 17. Bruder *et al* (1981), who also find a positive effect, analyse a sample of 48. Amongst papers which find a negative association are Merrin (1984) using a sample of 52 individuals with schizophrenia and Muscovitch, Strauss and Olds (1981) using a sample of patients with unipolar endogenous depression. Overby (1994) and Elias *et al* (2001) are two non-clinical studies using samples of university students. Interestingly, they find opposite results. The former paper finds a positive association for females only and no effect for men whereas the latter finds a positive effect for men only and no effect for women[2]. This note utilises a new large cross-country dataset, SHARE, to revisit the question.

[1] See Coren (1993), Gelman & Weekliem (2007) for example

[2] See Elias et al (2001) for a review of the findings.

Data and Methods

The dataset used is SHARE: the Survey of Ageing, Health and Retirement in Europe. This collects data from nationally representative samples of the non-institutional population aged 50 years and older. The primary sampling unit is a household and all individuals in the household who are in the target age category are interviewed. This paper used release 2 of the dataset which includes 12 countries[3]. The sampling plan follows a complex probabilistic multistage design. Hence probability weights (calibrated by age and sex) are used to ensure that the sample is representative. For estimation purposes, each country is treated as a stratum and allows for clustering within households. The size of the sample used in the estimation is 27,482.

Two measures of mental health are used. Euro-D is a 12 item scale developed by the EURODEP Consortium (Prince *et al* 1999, Copeland 1999). The items are a subset of those on the Geriatric Mental State. The scale was created to provide a simple measure of the extent of depressive symptoms that could be used for comparing across European countries. The questions refer to the presence of these symptoms in the last month. The second measure was a binary variable indicating the yes/no response to the question "Has there been a time or times in your life when you suffered from symptoms of depression which lasted at least two weeks?" Handedness was measured simply by asking the respondents what their dominant hand was. Descriptive statistics for the data are in Table 1. The proportion of left-handers is about 7%, somewhat lower than many population estimates. However given that the average age is 64 and that the observed frequency of left-handedness is much lower amongst older populations this is not exceptionally low[4].

[3] They are Austria, Belgium, Denmark, France, Germany, Greece, Italy, Netherlands, Spain, Sweden, Switzerland and Israel. The first release of the data which was collected in 2004 consists of the first 11 countries listed. Preliminary data from Israel, collected in 2005-2006, was included in release 2. Visit http://www.share-project.org/ for more information.

[4] See McManus (2002) Figure 9.1.

To see how the mean of Euro-D varied with handedness we use least squares regression with handedness interacted with sex as explanatory variables. The comparison group is right-handed males. Since the other outcome of interest is binary we estimate a probit model which predicts the probability that an individual will have ever experienced depressive symptoms using the same explanatory variables as the first model. One could estimate a much richer model with additional covariates that will predict depression (including marital status, age, history of chronic illness for example). However including these in the model – while they may be of interest in their own right- has no effect on the results of interest here. This is not surprising since these variables are largely orthogonal to handedness hence there is no omitted variable bias.

Results

The results of the data analysis are in Table 2. The first column reports the coefficients from the regression of the Euro-D scale on the sex by handedness interaction. Left-handed males have a higher level of depressive symptoms than right-handed males being 0.227 higher on average. Since the mean for the comparison group is 1.814, this is about a 12.5% difference. Another way of looking at this is that the difference is about one quarter of the difference due to sex, the mean Euro-D score for females being higher than males by approximately 1. For females, the mean level of depressive symptoms is about 0.05 *lower* for left-handed females compared to right-handed females. However this difference, aside from being small in absolute terms, is not statistically significant (p value = 0.625).

The second column reports the marginal effects from the probit model. The results indicate that left-handed males are 5.5% (i.e. 5.5 percentage points) more likely to have ever experienced depression compared to right handed males. For the comparison group the baseline incidence is about 19 percentage points so left-handed males are

almost 30% (=5.5/19) more likely to have experienced depressive symptoms than right-handed males. Unlike the results for Euro-D, left-handed females fare worse on this measure than their right-handed counterparts with the difference being about 5 percentage points (=0.187-0.136). However, again, the difference between handedness groups for females is not statistically significant at the 90% level (p value = 0.15). To summarize, using either measure one finds that, amongst males, depressive symptoms are more common among left-handers but there is no association between handedness and depression for females.

Discussion

The results here are in line with those of Elias *et al* (2001) who also found a positive association between left-handedness and depression for males but not for females. What is striking is that the population here is very different from that used in the later paper. That the results differ for men and women is not surprising in the sense that such interactions are quite common in the research literature on handedness. Sex-handedness interactions have been found in, *inter alia*, brain morphology (Witelson & Kigar 1992), divergent thinking (Coren 1993), novelty seeking (Goldberg *et al* 1994), school performance (Faurie, Vianey-Liaud & Raymond 2006) and earnings (Denny & O'Sullivan 2007). Why there should be such interactions in general or in this particular case is unclear. If the effect of handedness was due to societal factors, such as stigma associated with left-handedness, it seems unlikely that it would only be present in males. A biological explanation seems to be more plausible.

This paper (like the bulk of the literature) uses hand preference i.e. a simple right/left categorization of individuals because that is what is available in the data. There is some evidence and *a priori* argument that strength of handedness is as important if not more so than hand preference. For example both Crow *et al* (1998) and Denny (2008) use continuous measures of handedness to explain cognitive ability while Grace (1987)

finds that the strength of handedness is correlated with delinquency. Christman (2005,2006) provides a theoretical perspective emphasizing strength of handedness as an indicator of inter-hemispheric interaction. A feature of much of this literature is that those at the two ends of a handedness continuum form a distinct group from those at the center (i.e. the ambidextrous). An interesting challenge for future work would be to investigate whether this also holds for affective disorders and, in particular, whether ambidexterity is associated with a higher or lower probability of being depressed.

Table 1: Descriptive statistics

	Males	Females
Euro-D depression scale	1.830	2.817
	(0.025)	(0.028)
Ever depressed	0.194	0.327
	(0.005)	(0.006)
Right handed	0.931	0.938
	(0.003)	(0.003)
	44.1%	55.9%

Notes: Coefficients are weighted means. Estimated standard errors are in parentheses.

Table 2: Depressive symptoms as a function of sex and handedness

	1 Euro-D	2 Ever Depressed
Male left-handed	0.227	0.055
	(2.18)	(2.26)
Female right-handed	1.006	0.136
	(27.19)	(17.42)
Female left-handed	0.952	0.187
	(8.74)	(7.61)
Constant	1.814	
	(69.70)	
R^2	0.047	
N	27,482	27,482

Notes: Model 1 is a linear regression of the Euro-D scale on the interaction of sex and handedness. Model 2 is a probit model of the probability of an individual ever experiencing symptoms of depression. The coefficients in Model 2 are marginal effects: the effect on the probability of the outcome occurring. Numbers in parentheses are t ratios. Right-handed males are the omitted category. Estimation uses the regression and probit commands for survey data in Stata 9.

ACKNOWLEDGEMENTS

This paper uses data from release 2 of SHARE 2004. The data collection has been primarily funded by the European Commission through the 5th framework programme (project QLK6-CT-2001-00360 in the Quality of Life programme). Additional funding came from the US National Institute on Aging (U01 AG09740-13S2, P01 AG005842, P01 AG08291, P30 AG12815, Y1-AG-4553-01 and OGHA 04-064). Data collection in Austria (through the Austrian Science Foundation, FWF), Belgium (through the Belgian Science Policy Office) and Switzerland (through BBW/OFES/UFES) was nationally funded. Data collection in Israel was funded by the US National Institute on Aging (R21 AG025169), by the German-Israeli Foundation for Scientific Research and Development (G.I.F.), and the National Insurance Institute of Israel. Further support by the European Commission through the 6th framework program (projects SHARE-I3, RII-CT-2006-062193, and COMPARE, CIT5-CT-2005-028857) is acknowledged. For methodological details see Boersch-Supan and Juerges (2005).

REFERENCES

Biederman, J., Lapey, K. A., Milberger, S., Faraone, S. V., Reed, E. D. & Seidman, L. J. (1994). Motor preference, major depression and psychosocial dysfunction among children with attention deficit hyperactivity disorder. *Journal of Psychiatric Research,* 28(2): 171 - 184.

Boersch-Supan, A.& Juerges, H. (2005) (editors). *The Survey of Health, Aging, and Retirement in Europe – Methodology*, Mannheim MEA

Bruder, G., Sutton, S., Berger-Gross, P., Quitkin, F., & Davies, S. (1981). Lateralized auditory processing in depression: Dichotic click detection. *Psychiatry Research,* 4(3): 253-66.

Christman, S.D. (2005). *It's mixed versus strong, not left versus right: Handedness as a wide-ranging dimension of individual difference*. Presented at the Annual Meeting of the Midwestern Psychological Association, Chicago, May

Christman, S.D. (2006). *Degree (mixed versus strong) versus direction (left versus right): rethinking the measurement and meaning of handedness*. Unpublished manuscript, University of Toledo

Copeland, J.R.M. (1999) Depression of older age. *British Journal of Psychiatry* 174: 304-306

Coren, S. (1993) Failure to find statistical significance in left-handedness and pathology studies: a forgotten consideration. *Bulletin of the Psychonomic Society,* 31: 443-446

Coren, S. (1995) Differences in Divergent Thinking as a Function of Handedness and Sex. *American Journal of Psychology* 108(3):311–25

Crow, T.J. (1997) Schizophrenia as a failure of hemispheric dominance for language. *Trends in Neurosciences*, **20**, 339-343

Crow T.J., L.R. Crow, D.J. Done and S. Leask. (1998). Relative hand skill predicts academic ability: global deficits at the point of hemispheric indecision. *Neuropsychologia*, 36 (12), 1275-1281.

Denny K. & O'Sullivan, V. (2007) The economic consequences of being left-handed. *Journal of Human Resources* XLII:353-374

Denny, K., Cognitive ability and continuous measures of relative hand skill: A note, *Neuropsychologia* (2008), doi:10.1016/j.neuropsychologia.2008.02.004

Elias L.J., Saucier D.M. & Guylee, M.J. (2001) Handedness and depression in university students: a sex by handedness interaction. *Brain and Cognition* 46: 125-129

Faurie, C., Vianey-Liaud, N. & Raymond, M. (2006) Do Left-Handed Children Have Advantages Regarding School Performance and Leadership Skills? *Laterality* 11:57-70

Gelman, A. & Weakliem, D. (2007). Of beauty, sex and power: statistical challenges in estimating small effects. Unpublished Technical Paper, Statistics Department, Columbia University, New York

Goldberg, E., Harner, E.R.., Lovell, M., Podell, K. & Riggio, S. (1994) Cognitive Bias, Functional Cortical Geometry and the Frontal Lobes: Laterality, Sex and Handedness. *Journal of Cognitive Neuroscience* 6(3):276–96.

Grace, W.G. (1987) Strength of handedness as an indicant of delinquents' behavior. *Journal of Clinical Psychology*. 43:151-155

Klar, A.J.S. (1999) Genetic models for handedness, brain lateralization, schizophrenia, and manic-depression. *Schizophrenia Research* 39: 207-218

McManus C. (2002) *Right hand left hand: the origins of asymmetry in brains, bodies, atoms and cultures* London: Weidenfeld & Nicholson

Merrin, E. L. (1984). Motor and sighting dominance in chronic schizophrenics: Relationship to social competence, age at first admission, and clinical course. *British Journal of Psychiatry*, 145: 401-406.

Moscovitch, M., Strauss, E., & Olds, J. (1981). Handedness and dichotic listening performance in patients with unipolar endogenous depression who received ECT. *American Journal of Psychiatry,* 138(7): 988-990.

Prince M.J., Reischies F., Beekman A.T.F., Fuhrer R., Jonker, C., Kivela S.L., Lawlor, B.A., Lobo A., Magnusson H., Fichter, M., Van Oyen, H., Roelands, M., Skoog, I., Turrina, C. & Copeland, J.R.M. (1999) Development of the EURO-D scale - a European Union initiative to compare symptoms of depression in 14 European centres. *British Journal of Psychiatry*, 174: 330-338

Sommer, I., Aleman, A., Ramsey, N., Bouma, A., & Kahn R. (2001**)** Handedness**,** language lateralisation and anatomical asymmetry in schizophrenia. Meta-analysis. *British Journal of Psychiatry*, 178: 344-351

Witelson, S. & Kigar, D. (1992) Sylvian fissure morphology and asymmetry in men and women: bilateral differences in relation to handedness in men. *The Journal of Comparative Neurology*, 323: 326-340.